Theory of individual development.—In a Darwin Anniversary address given at the University of Chicago and now published,[10] LILLIE analyzes organic development and the theories relating to it in an unusually clear and satisfactory way. He calls attention to the fact that ontogeny and phylogeny are not two separate and distinct series of phenomena, and that individual development is not something distinct from evolution, but is a part of the process of evolution. In fact, we have no actual experience of any other form of development than individual development, racial development being an inference from innumerable facts. The development of the individual is a series of processes, capable of resolution into simpler biological processes, and these presumably into physico-chemical events. Such attempted analyses come under the head of physiology of development, a method of attack known in Germany as developmental mechanics. Under this head the author discusses embryonic primordia and the law of genetic restriction, the principle of organization, the rôle of cell division in development, and environment.

The presentation of the last topic is especially suggestive, both extra-organic and intra-organic environment being recognized. The former needs no definition; the latter may be defined by the statement that each part of a developing embryo has an environment consisting of all the other parts, some of which constitute relatively immediate environmental factors, others relatively remote ones. Examples of experiments are given to illustrate the influence of intra-organic environment on development, which also show that an immense part of what is called inheritance is inheritance of environment only, that is, repetition of similar developmental processes under similar conditions. It is stated that we are driven to the conclusion that the apparent simplicity of the germ is real; that the germ contains no gemmules, or determinants, or other representative particles; that development is truly epigenetic, a natural series of events that succeed one another according to physico-chemical and physiological laws; and that the explanation of the sequence consists simply in the discovery of each of its steps.

The author discusses certain applications of this point of view, and shows that such biological conceptions as the inheritance of acquired characters, atavism, and unit characters are inconsistent with it, special attention being given to the last because it is essentially modern and has many adherents. The analysis of the term "character" is very effective, the term having been prescribed by taxonomists and meaning any definable feature of an anatomical kind that differentiates species. The study of the physiology of development shows that whatever else "characters" may be, they are not units; "they simply represent the sum of all physiological processes coming to expression in definable areas or ways." *Character* is essentially a static morphological term; in the study of heredity and development we are dealing with biological *processes*.

The general conclusion is that the theory of individual development must

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[10] LILLIE, FRANK R., The theory of individual development. Popular Science Monthly **75**:239–252. 1909.

more and more come to be regarded as a branch of physiology proper. The theory of representative particles must be relegated to the class of formal hypotheses whose usefulness is largely outlived; and while it may still play a part in speculations on heredity, the author believes that it will come to be generally recognized by those who use it as a mere matter of convenience of terminology, and not as an explanation of the phenomena described in its terms.—J. M. C.

The rôle of glucosides.—WEEVERS continues his researches on the glucosides of plants, with investigations of arbutin and salicin, and their allies.[11] He reports that both are to be considered as reserve foods, the combination of benzol derivatives with glucose serving to form compounds of low diffusibility, and therefore suitable for the accumulation of sugar in the cells. Arbutin in *Vaccinium Vitis-idaea* is localized in the leaves, and is used in the spring when the shoots develop, being split by an enzyme into glucose and hydrochinon. The latter remains in the leaves and is used again to combine with the glucose formed by photosynthesis, none being free in autumn. *Pirus communis* contains a glucoside which is probably identical with arbutin, and behaves in the same way. In *Salix purpurea* and *Populus monilifera* there appears to be a complex of enzymes, of which one, salicase, splits salicin into saligenol and glucose; another, saligenase, destroys saligenol and produces catechol; and a third breaks up catechol, forming a black amorphous insoluble pigment. This catecholase, however, gets at catechol only on decay of the tissues. All summer, salicin is formed daily in the leaves; nightly it is hydrolyzed and the glucose is carried away to the cortex. When in autumn the salicin content of the cortex approaches that of the leaves, this process stops. Populin is another product common to the two genera, but more variable in behavior. Populase forms catechol from it also.—C. R. B.

Hindi cotton.—COOK[12] has published a statement in reference to Hindi cotton, the interest of which extends beyond the immediate cultural problem. The name is applied in Egypt to an undesirable type of cotton that injures the high-grade varieties by infesting them with hybrids. The introduction of Egyptian cotton into the United States has introduced also the problem of Hindi cotton. There has been much speculation as to the nature and origin of this pernicious type, the name having suggested an origin from India. Experiments with Egyptian cotton in Arizona resulted in the appearance of the so-called "Hindi" variations, and comparison with other types show that Hindi cotton is of American origin. It is not identical with any of the upland varieties of the United States, but is to be associated with upland types indigenous in Mexico and Central America. Egyptian and other Sea Island types also have originated in tropical America, and the author concludes that "it becomes possible to view the Hindi variants as ex-

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[11] WEEVERS, TH., Die physiologische Bedeutung einiger Glycoside. (Fortsetzung.) Recueil Trav. Bot. Néerl. **7**:1–62. 1910.

[12] COOK, O. F., Origin of the Hindi cotton. Circ. 42, Bur. Pl. Ind., U. S. Depart. Agric. pp. 12. *figs.* 2. 1909.